

encapsulating process becomes unnecessary can be produced. The aforementioned bump can also be provided by a bump that is formed roughly similarly to Figs. 37A and 37B in terms of appearance by plating or printing. For example, it is 5 possible to form a bump of titanium, nickel, and gold provided by plating in this order on the IC chip electrode or print a paste obtained by mixing aluminum, nickel, or the like with a synthetic resin on the IC chip electrode and drying or hardening the same to form a polymer bump. 10 Particularly when a leveled bump or a bump formed by plating or printing is employed, it is concerned that the electrical connection between the bump and the board electrode might become unstable due to the possible occurrence of the unintended placement of the inorganic 15 filler between the bump and the board electrode since the deformation of the bump is little. However, the conductive particles 10a are to be placed between the bump and the board electrode, and the continuity between the bump and the board electrode can be secured with this conductive 20 particles 10a.

As described above, the present invention is able to eliminate the processes that have conventionally been needed for bonding an electronic component to a circuit board and remarkably improve the productivity.

25 The following effects can also be produced.

(1) Bump formation

According to the method of forming a bump with plating (third prior art), a special bump forming process is required to be performed by the semiconductor manufacturer, and therefore, the bump formation can be formed only by the limited manufacturers. However, according to the present invention, IC chips for general-purpose wire bonding can be employed as an example of the electronic component by means of a wire bonding device, and IC chips can easily be available.

Moreover, the bump leveling for stabilizing the amount of transfer of the adhesive in an unstable transfer process of transfer such as the transfer of the conductive adhesive becomes unnecessary by comparison with the method of the first prior art, and the leveling device for such a leveling process becomes unnecessary.

If the approximately conically tipped bump is formed on the electrode of an electronic component, even when the bump is mounted on the electrode of the circuit board while being shifted, the bump can partially come in contact with the electrode of the board without fail so long as the shift is not greater than half the outside diameter of the bump since the bump has the approximately conically tipped shape. According to the conventional bump, the so-called base of the bump partially comes in contact

with the electrode. However, this contact is mere partial contact, leading to unstable bonding. If this is subjected to a thermal shock test or reflow, the bonded portion becomes open. The present invention can eliminate the above-mentioned unstable bonding and provide the bonding of high production yield and high reliability.

5 (2) Bonding of IC chip to circuit board

According to the method of the second prior art, the connection resistance has been depended on the number 10 of conductive particles that exist between the bump and the electrode of the circuit board. However, according to the present invention, it is not required to place conductive particles between both the electrodes for the electrical continuity between the electronic component side electrode 15 and the board side electrode, and the bump can be directly connected to the electrode by being pressed against the electrode of the circuit board with a load (for example, a pressure force of not smaller than 20 gf per bump) heavier than in the first and second prior art examples without 20 being leveled in the leveling process as an independent process. Therefore, the connection resistance value does not depend on the number of interposed particles, and the connection resistance value can be stably obtained. That 25 is, the conductive particles produce the additional effect that the value of the connection resistance between the